United Kingdom Overseas Territories Aviation Circular

OTAC 139-31
172-15

Air Traffic Management and Airport Capacity

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GENERAL

Overseas Territories Aviation Circulars are issued to provide advice, guidance and information on standards, practices and procedures necessary to support Overseas Territory Aviation Requirements. They are not in themselves law but may amplify a provision of the Air Navigation (Overseas Territories) Order or provide practical guidance on meeting a requirement contained in the Overseas Territories Aviation Requirements.

PURPOSE

This OTAC provides guidance on assessing airport and airspace capacity and staffing requirements to meet operational needs.

RELATED REQUIREMENTS

This Circular relates to OTAR Parts 172 and 139.

CHANGE INFORMATION

First issue.

ENQUIRIES

Enquiries regarding the content of this Circular should be addressed to Air Safety Support International at the address on the ASSI website www.airsafety.aero or to the appropriate Overseas Territory Aviation Authority.

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1. Introduction

This OTAC provides guidance on the Assessment of Airport Capacity. The OTAC highlights airports being part of the whole ATM system in a gate-to-gate system. The system is managed by a network manager who will collaborate with operational stakeholders, air traffic control, airspace users and the airport operator. In operational terms, this means improving air traffic flow and airspace management to help improve efficiency. This, in turn, improves the overall growth and overall system operations and planning.

2. Definitions

Demand. The airlines schedule from creation right up to the flight plans submitted on the day of operation.

Throughput. The airport's actual air traffic movement on the day of operations.

Capacity. The theoretical air traffic movement capability of an airport. However, there are a number of variables in this definition that give rise to key performance capacity indicators such as:

- Maximum hourly number of movements possible during visual or instrument meteorological conditions.
- Maximum daily number of movements possible between the core hours during visual or instrument meteorological conditions.
- Average daily airport capacity measured as a moving average.
- Other considerations such as wind, mixture of aircraft types, system capabilities, and staffing levels should be considered when defining capacity.

Structural Airside Capacity. A macro-level capacity assessment that assists in identifying an airport's capacity as a baseline for planning. It focussed on the needs of an airport to determine what the infrastructure is capable of in principle and if/when to start the process of infrastructure upgrades.

Planned Capacity. A calculation completed prior to a specific period where scheduled aircraft movement change.

Operational Capacity. An assessment performed in the days before and the day after operations with an objective of integrating the latest detailed constraints and up to date capacity figures.

Temporal Efficiency. The retrospective performance assessment of airport in terms of delays and covers aspects such on time departure, average departure delay of delayed flights.

Flight Efficiency. Trajectory-orientated based on the caparison of predicting demand with assessed capacity.

3. Measuring Airport Capacity

Airport capacity is affected by many factors which are classified as the Airspace Domain, Airside Domain and Landside Domain. Each of these areas being crucial to capacity assessment. The scope for measuring airport capacity is defined in Figure 1-1. Airports should define their capacity and plans for the development of the aerodrome infrastructure in their Airport Design and Master Plan. The Master Plan will be developed by various drivers. In the context of capacity, the main internal driver will be efficiency, and the main external drivers will likely be demand, regulation, and environment.

Internal Driver – Efficiency. Current demand is causing delays in good or poor weather conditions, or traffic growth is forecast, and both economic and network related drivers will require additional demand be accommodated. This is a reactive indication that requires the airport to make changes to the Master Plan.

External Driver - Regulation. OTAR 172 Air Traffic Services Organisation Requirements defines the regulations for new and existing ATSU. The OTAR requires that ATSUs develop and maintain policies and procedures for determining the capacity of the airport and ATS system. The policies and procedures must include and define staffing levels to adequately operate the system. In addition to these requirements, PANS ATM Doc 4444 defines specific factors and methods for assessing and enhancing ATS capacity.

Internal and External Driver - Aligning airspace and ground capacity. It's essential that ANSPs and airport operators align strategies. The assessment and future development of any capacity programme must consider traffic demand in conjunction with airlines and other aircraft operators and should be expressed in the Airport Master Plan. Inputs from these key stakeholders will allow for the Master Plan to reflect agreed future needs and ensure an aligned and synchronised approach to the capacity assessment and future developments.

Capacity can be calculated using various approaches. Each airport operator, in conjunction with the relevant ANSP should consider the following factors when deciding on any single or combination of approaches:

Operating Requirements – PPR only, Category C requirements, Air Operator Briefing

Operating Environment – Aerodrome layout, Local weather phenomena, need or ability for future expansion.

Operational Data – Seasonal aircraft movements and Aircraft types.

4. Capacity Calculation Methods

The method and need for capacity to be assessed will vary from airport to airport. Whether it be effort, data, or cost, each aerodrome should use the appropriate tools and resources available to adequately assess their baseline capacity.

To better under the methods, it's important to understand why we need to assess capacity.

Establishing a Baseline. Before the need for enhancement or amendment of the Master Plan, a capacity baseline must be established. Mainly, the alignment of Airspace and Airside Performance as an indicator will be used as a benchmark to measure against future changes and their effect on the operational efficiency of the airport.

Method 1 – Historical Throughput. Reviewing historical data against current throughput is a basic but very effective way to track the airport and airspace system's performance and aid in identifying degraded performance and contributing factors. The critical aspect is to collect the data in as much detail as possible to ensure correlation can occur between the state of the airport (weather, airspace, runway, taxiways/apron or gates, staffing, system failures etc.) and the performance on the day. This data becomes increasingly valid the more the airport operates under continuous demanding conditions over time.

Method 2 – Look Up Tables and Analytical Models. FAA advisory circular AC 150/5060-5 provides an example of a look-up style analysis that can be used for simple hourly capacity and annual capacity. The AC does not account for the current state of the art concepts such as Time-Based Separations or Wake vortex re-categorisation. They also do not include the impact of electronic flight strips or advanced surface movement guidance control systems (A-SMGCS). Any data taken from the AC should be viewed as a high-level starting point for future assessment.

Method 3 – Simulation Models. Bespoke simulation models are flexible and can incorporate a huge range of characteristics that are applicable to your aerodrome.

Method 4 - Airport Collaborative Decision Making (A-CDM). Airport CDM (A-CDM) aims to improve the efficiency and resilience of airport operations by optimising the use of resources and improving the predictability of air traffic. It achieves this by encouraging the airport partners (airport operators, aircraft operators, ground handlers and ATC) and the Network Manager to work more transparently and collaboratively, exchanging relevant, accurate and timely information. It focuses especially on aircraft turn-round and pre-departure processes.
It also allows the exchange of more accurate departure information, particularly target take-off times, with the ATM network, leading to improved en-route and sectoral planning.

Airports that select A-CDM as their method for assessing capacity should first review the elements required to implement an effective A-CDM. Implementing A-CDM is a task in itself that requires resources, expertise, and experience for the method to provide the appropriate baseline capacity output.

The following table is divided into influencing factors and assumptions. Influencing factors are proposed where perhaps different scenarios may be run to analyse the impacts on capacity. The assumptions are not considered as variable but static and are allocated to the influencing factors.

Influencing factors	Assumptions
Runway Operations Capacity – Airspace/Airside Domain	
Different Runway Mode Scenarios: Analyse for all modes enabled by the infrastructure.	- Mix in wake vortex categories; - No noise abatement restrictions; - No political constraints on movement rates; - No constraints on airspace acceptance.
Weather Scenarios	- Assume the percentage of VMC vs IMC for each season.
Taxi Operations Capacity	
Access to all taxiways for each runway	- Sufficient entry/exits to support defined runway Occupancy Times.
Runway Crossing or Runway backtrack Operations	- Assumed crossing runway/runway backtrack delay time and/or rules for both operations.
Taxiway queuing in IMC and VMC	- No constraints on Aerodrome Lighting; - Sustainable maximum number of aircraft on taxiways in VMC and IMC.
Apron/Gate Operations Capacity	
Turnaround time	- Turnaround time for all apron and operators; - No constraints on ground handler resources; - No constraint on landside capacity.
Stand/Gate Compatibility	- No constraints on aircraft stand/gate compatibility.

5. Improvement and Enhancement

A fundamental principle of enhancing airport capacity is the need to monitor performance. Only by measuring performance can new measure be assessed and refined for long-term use. Adopting standard methods for collecting data will ensure that performance is measured against the same parameters and, therefore, can assure the long-term improvement process.

The decision to commence airport capacity enhancement activities should be decided locally. Economic factors and executive strategic visions play a significant role and should be defined in the Master Plan. From a performance viewpoint, there are a number of examples that could be triggers for enhancement. The triggers supported by ongoing monitoring could provide the airport with a useful tool to ensure the initiation of activities are not delayed and are based on measurement criteria.

When using baseline capacity as a trigger, it could simply be a matter of looking at the schedule and forecasted demand when it reaches a pre-defined percentage threshold of the baseline structural capacity and is expected to increase, then enhancement activities can be established or reviewed for implementation. When using the planned and operational capacity to compare against, the potential enhancement options become more limited given the shorter time frames involved (i.e. some infrastructure options may not be completed in time). As such more refined triggers may be needed to focus on the specific constraining areas for targeted enhancement.

While delay thresholds are not recommended as part of the baseline capacity assessment, monitoring delay can be useful when considering a business case caparison. For this to be accurate, each airport must define which delays definitions are accepted by all stakeholders. Then it's a matter of measuring and assessing the current delay performance through simulations to determine the delay triggers to be set. The choice of triggers will be based on a local strategy of wither targeting full capacity at the risk of generating delay or a proactive measure to avoid delay.

Capacity enhancement should be lead by the airport operator but may also be lead by the ANSP depending on the best fit for the airport. The creation of the capacity enhancement team is a natural by-product of the capacity assessment process. The structure of the Team must account for all the key stakeholders and enable a clear approach to integrated enhancement, prioritisation and implementation. In many cases, the Team may already exist in structure, and only a small change to current meetings and agendas is required. The role of the Capacity Enhancement Steering Group is to define the capacity enhancement process in terms of:

- Scope – what will the capacity enhancement process cover?
- Targets – what increases are needed and by when?
- Method – what method should be used?
- Deliverables – setting priorities and timescales.
- Team – who should be appointed to manage the process from ATC, airlines and airport operator?

The Team should consist of ATC Management, Airline Operator Management, Airport Management and the Airport Coordinator if the position exists. It should contain the decision-making authority to commit resources for the implementation of identified enhancements. Each Management position should ensure an integrated safety process is also carried out for any proposed changes.

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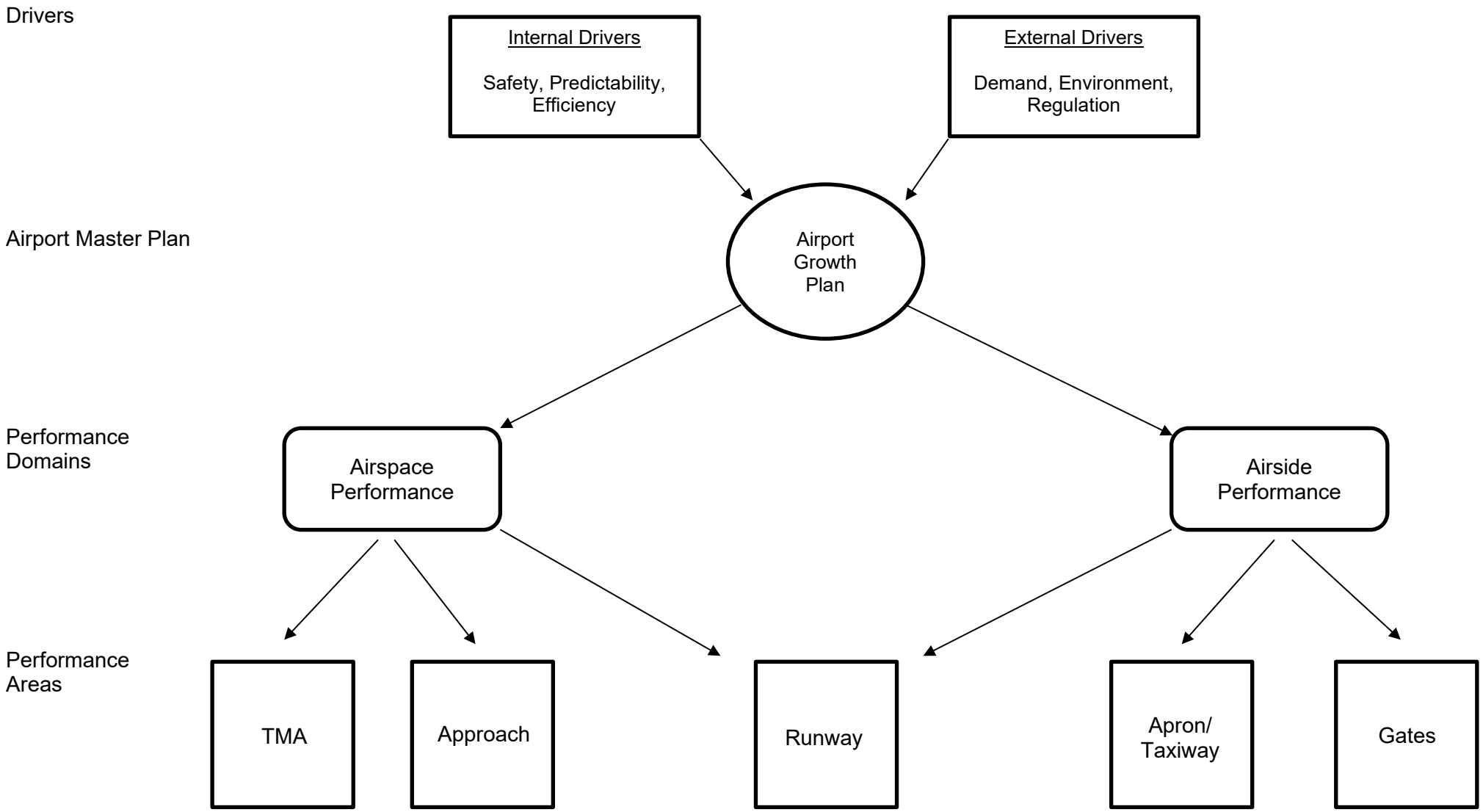
Drivers
Internal Drivers
Safety, Predictability, Efficiency
External Drivers
Demand, Environment, Regulation
Airport Master Plan
Airport Growth Plan
Performance Domains
Airspace Performance
Airside Performance
Performance Areas
TMA
Approach
Runway
Apron/ Taxiway
Gates

Figure 1-1